We claim:

1. A computer-implemented method for animating an image based on a scene description that includes one or more geometric objects and one or more particle systems, the method comprising:

generating a plurality of cutout particles, each cutout particle corresponding to a geometric object in the scene description;

rendering the particle systems with the cutout particles to generate a particle image, wherein at least some cutout particles occlude particles of the particles systems; and

compositing the particle image with an image of the geometric objects to create a composited image.

2. The method of claim 1, wherein generating a plurality of cutout particles comprises:

rendering the geometric objects to produce a depth map, the depth map including a plurality of entries that each indicate a distance to a nearest geometric object from a camera position in a particular direction; and

generating cutout particles from at least some of the entries in the depth map, each cutout particle corresponding to an entry in the depth map in three-dimensional space.

3. The method of claim 2, wherein the cutout particles are generated at a higher resolution than the particle image.

4. The method of claim 2, wherein the cutout particles are generated at a higher resolution than the particle image along any silhouette edges of the depth map.

5. The method of claim 1, wherein generating a plurality of cutout particles comprises sampling the geometric objects at a higher resolution than the particle image at least in areas where aliasing is likely to occur.

6. The method of claim 1, wherein the rendering comprises:

for at least some of the particles of the particle systems and at least some of the cutout particles, performing a compositing operation to determine a coloring or an occluding effect of the particle on one or more pixels of the particle image.

7. The method of claim 6, wherein the compositing operation is performed for the particles from the farthest particle from a camera position to the nearest particle.

8. The method of claim 6, wherein the particles of the particle systems have coloring effects on at least one pixel of the particle image and the cutout particles have occluding effects on at least one pixel of the particle image, a coloring effect tending to

accumulate color for the pixel and an occluding effect tending to block any accumulated color for the pixel.

9. The method of claim 1, wherein the rendering comprises:

combining the particles from the particle systems and the cutout particles into a list;

sorting the list by each particle's distance from a camera position; and

for each particle in the list, from the farthest to the nearest, determining a coloring or an occluding effect of the particle on one or more pixels of the particle image.

10. The method of claim 1, wherein the rendering comprises:

combining the coloring effects of the particles of the particle systems and the occluding effects of the cutout particles to determine the color for a plurality of pixels in the particle image.

11. The method of claim 1, wherein the rendering comprises:

a step for resolving the coloring effects of the particles of the particle systems and the occluding effects of the cutout particles based on the depth of the associated particles.

12. The method of claim 1, wherein the compositing comprises alpha blending the particle image with a rendered image of the geometric objects.

13. The method of claim 1, wherein the rendering comprises:

for each particle, determining which pixels in the particle image the particle covers and an amount of the pixel covered, as seen from a camera position.

14. The method of claim 13, wherein the rendering comprises:

computing a depth of field adjustment for a cutout particle.

15. The method of claim 13, wherein the rendering comprises:

computing a motion blur adjustment for a cutout particle.

16. A computer-implemented method for rendering one or more particle systems to produce a particle image to be combined with a second image, the method comprising:

generating a plurality of cutout particles associated with a three-dimensional position of objects in the second image;

for each of a plurality of pixels in the particle image, computing a list of coverage layers for the pixel, where each coverage layer in the list of coverage layers indicates an accumulated color value due to one or more particles of a particle system and an amount occluded by one or more cutout particles; and

determining the color of the pixels based on their associated coverage layer list.

17. The method of claim 16, wherein each list of coverage layers is generated by processing the particles in order from farthest from a camera position to nearest.

18. The method of claim 17, wherein computing a list of coverage layers for a pixel comprises:

adding a new coverage layer for a particle from a particle system that follows a cutout particle in the processing.

19. The method of claim 16, wherein generating the cutout particles comprises:

computing a depth map for the second image; and

generating a cutout particle for at least some entries in the depth map, each cutout particle being having a position in three-dimensional space corresponding to the depth map entry.

20. The method of claim 19, wherein at least portions of the depth map have a higher resolution than the particle image.

21. The method of claim 16, wherein the cutout particles are generated at a higher resolution than the particle image.

22. The method of claim 16, wherein generating a plurality of cutout particles comprises sampling geometric objects in the second image at a higher resolution than the particle image at least in areas where aliasing is likely to occur.

23. A computer program product comprising a computer-readable medium containing computer program code for performing any one of the methods of claims 1 through 22.

24. A system for animating an image based on a scene description that includes one or more geometric objects and one or more particle systems, the system comprising:

a geometry renderer for rendering the geometric objects in the scene description to generate a geometry image;

a cutout particle generator that generates a plurality of cutout particles, each cutout particle corresponding to a geometric object in the scene description;

a particle renderer for rendering the particle systems of the scene description and the cutout particles to generate a particle image, wherein at least some cutout particles occlude particles of the particles systems; and

a compositor that combines the geometric image and the particle image to form a composited image.

25. The system of claim 24, wherein the geometry renderer generates a depth map for the geometric objects in the scene description, and the cutout particle generator generates the cutout particles based on the depth map.

26. The system of claim 25, wherein the cutout particle generator generates the cutout particles at a higher resolution than the particle image at least in areas where aliasing is likely to occur.

27. The system of claim 24, wherein the particle renderer processes the particles from the farthest particle from a camera position to the nearest particle.

28. The system of claim 24, wherein the particle renderer is configured to:

combine the particles from the particle systems and the cutout particles into a list;

sort the list by each particle's distance from a camera position; and

for each particle in the list, from the farthest to the nearest, determine a coloring or an occluding effect of the particle on one or more pixels of the particle image.

29. The system of claim 24, wherein the particle renderer is configured to combine the coloring effects of the particles of the particle systems and the occluding

effects of the cutout particles to determine the color for a plurality of pixels in the particle image.

30. The system of claim 24, wherein for each of a plurality of pixels in the particle image, the particle renderer computes a list of coverage layers for the pixel, where each coverage layer in the list of coverage layers indicates an accumulated color value due to one or more particles of a particle system and an amount occluded by one or more cutout particles.

31. The system of claim 24, wherein the compositor alpha blends the particle image and the geometry image to form the composited image.